Project Introduction

Aurora proposes to transition UMD methods for insect-inspired, lightweight vision- and optical sensor-based navigation methods for a combined air-ground system that leverages the unique capabilities of airborne systems to achieve a progressively refined map of the exploration region which can be accessed by agents within the autonomous team for localization, and by scientists and other ground observers. Research during the Phase–I developed requirements, performed analyses and basic research that provided proof-of-concept demonstrations for navigational capabilities that will enhance the autonomous planetary and asteroid robotic exploration. Techniques derived from recent research were explored to demonstrate a concept for autonomous bio-inspired vision aided navigation to achieve navigation in GPS and magnetometer denied environments, generate obstacle maps and a 3 dimensional map of the environment based on optical flow and navigating to the origin of a map only based on optical flow input. This innovative research is providing a demonstration of the possibility of developing low size, weight and power solutions for vision based navigation by leveraging research on bio-inspired methodologies. During Phase-II further maturation of the algorithms, implementation on a higher fidelity simulation and prototypes and a conceptual design for a flight system will be pursued.

Primary U.S. Work Locations and Key Partners

Autonomous Navigation in GNSS-Denied Environments, Phase II
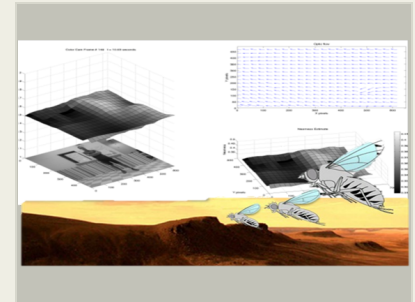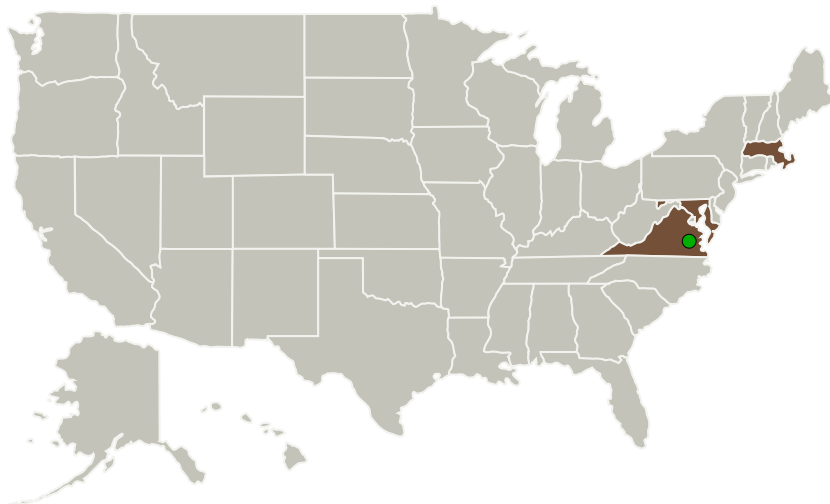
Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Organizations Performing Work	Role	Type	Location
🟢 Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia
University of Maryland-College Park(UMCP)	Supporting Organization	Academia Asian American Native American Pacific Islander (AANAPISI)	College Park, Maryland

Primary U.S. Work Locations	
Maryland	Massachusetts
Virginia	

Project Transitions

▶ **September 2014:** Project Start

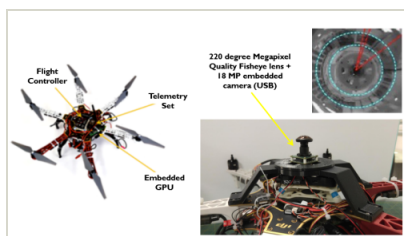✔ **March 2017:** Closed out

Closeout Documentation:
- Final Summary Chart(*https://techport.nasa.gov/file/137548*)
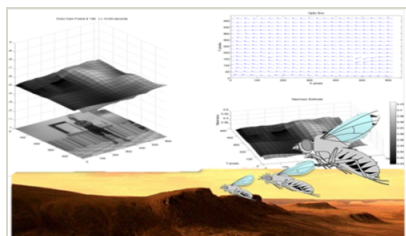
Images

Briefing Chart Image
Autonomous Navigation in GNSS-Denied Environments, Phase II
(*https://techport.nasa.gov/image/129477*)

Final Summary Chart Image
Autonomous Navigation in GNSS-Denied Environments, Phase II Project Image
(*https://techport.nasa.gov/image/133315*)

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Terrence Mckenna

Technology Maturity (TRL)

Start: **4**
Current: **4**
Estimated End: **4**

1	2	3	4	5	6	7	8	9
Applied Research			Development			Demo & Test		
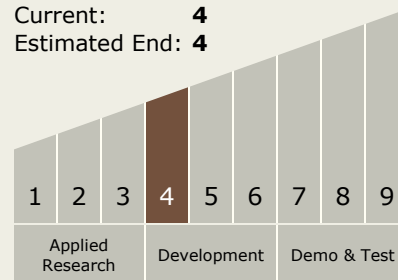
Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  └ TX17.2 Navigation Technologies
    └ TX17.2.3 Navigation Sensors

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System

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For more information and an accessible alternative, please visit:
https://techport.nasa.gov/view/17913

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